689G Telescopic Handler Service Manual
7-88730

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CASE CORPORATION
700 State Street
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450 Sherman Avenue
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Printed in U.S.A.
June, 1999

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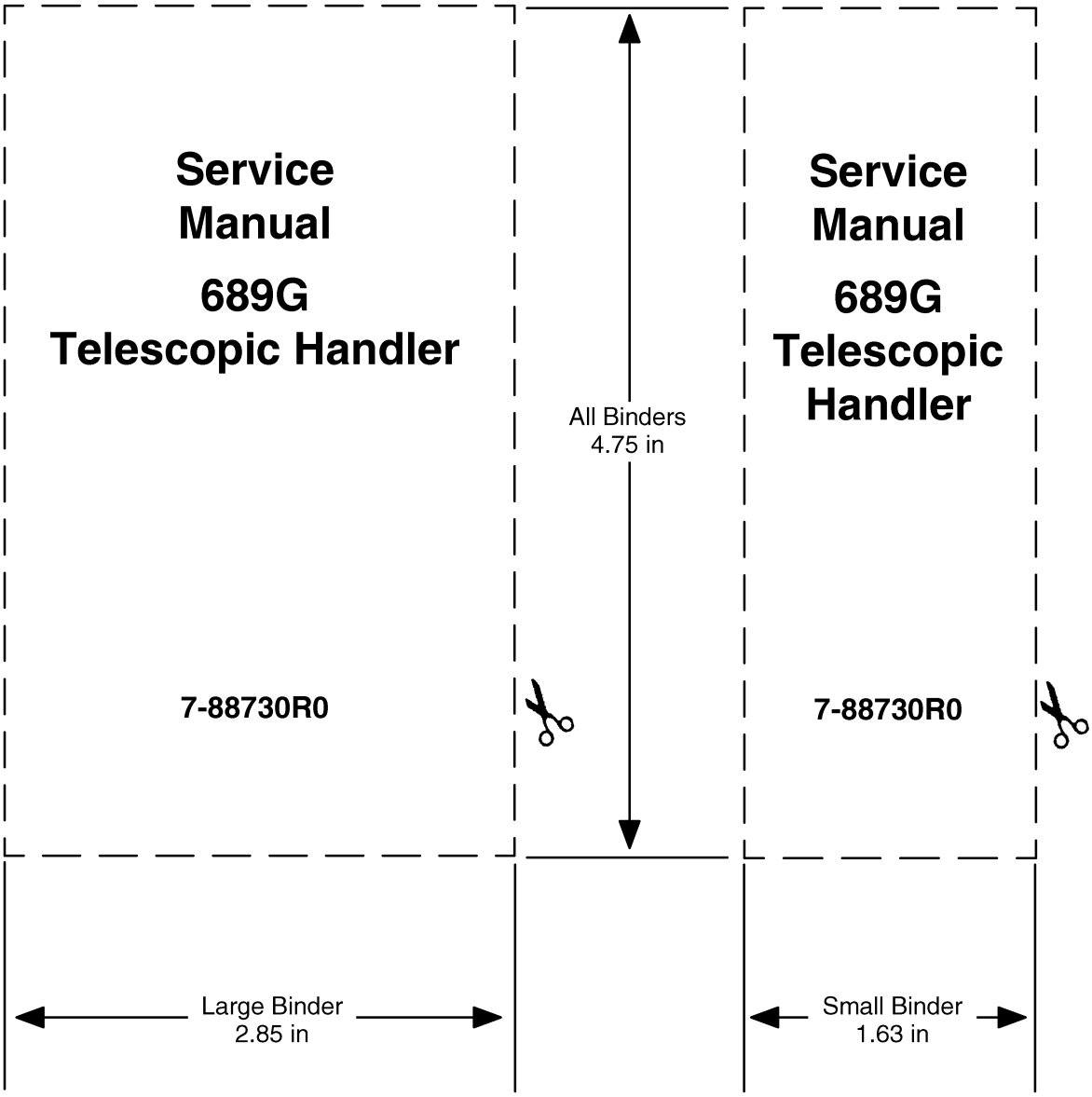
Service
Manual
689G
Telescopic Handler
7-88730R0
All Binders
4.75 in
Service
Manual
689G
Telescopic
Handler
7-88730R0
Large Binder
2.85 in
Small Binder
1.63 in

SECTION INDEX - GENERAL

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Section 1001

SAFETY AND GENERAL INFORMATION

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SAFETY INFORMATION

SAFETY ALERT SYMBOL

This is the Safety Alert Symbol. When you see this symbol in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

Understanding Signal Words

A signal word - WARNING - is used with the safety-alert symbol.

DANGER, WARNING, or CAUTION safety labels are located near specific hazards.

NOTE labels are for general information.

DANGER

DANGER IS USED TO INDICATE THE PRESENCE OF A HAZARD WHICH WILL CAUSE SEVERE PERSONAL INJURY OR DEATH IF THE WARNING IS IGNORED.

WARNING:

WARNING IS USED TO INDICATE THE PRESENCE OF A HAZARD WHICH CAN CAUSE SEVERE INJURY OR DEATH IF THE WARNING IS IGNORED.

CAUTION

CAUTION IS USED TO INDICATE THE PRESENCE OF A HAZARD WHICH WILL OR CAN CAUSE PERSONAL INJURY, OR PROPERTY DAMAGE IF THE WARNING IS IGNORED.

NOTE

NOTE is used to notify people of installation, operation, or maintenance information which is important but not hazard related.

General Safety Guidelines

Accidents are caused by failure to follow simple, fundamental safety rules and precautions. Most accidents can be avoided by paying attention, using common sense, and following instructions.

WARNING: *Improper maintenance can be hazardous.*

Read and understand SECTION 1001, SAFETY AND GENERAL INFORMATION before performing any maintenance, service, or repairs. M622

Study the operator's manual and service manual before starting, operating, maintaining, fueling, or servicing the 689G Telescopic Handlers.

Keep hands and fingers from between small parts. Wear protective gear such as safety glasses, heavy gloves, and safety shoes.

No unauthorized person should be allowed to operate, service, or maintain this material handler. Do not perform any work on the equipment that is unauthorized.

Read and understand all unit mounted safety labels before starting, operating, maintaining, fueling, or servicing this unit.

WARNING: *Unexpected machine motion or moving parts can cut or crush.*

Shutdown the engine before working on the machine. M621

Always make sure that the parking brake is set and the engine is shut down before starting any maintenance or service procedures.

Disconnect the battery and tag all controls according to OSHA requirements to warn that work is in progress.

Always wear proper safety equipment as required for the job. Consult your supervisor for specific job related safety equipment requirements.

Do not wear rings, watches, jewelry, or loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets, or anything else that could possibly get caught up in moving parts. Long hair must be tied back or otherwise secured.

Keep the maintenance area clean and dry. Remove water or oil slicks immediately.

Be sure all mechanics tools are in good condition. Do not use tools that are extremely worn out, rounded out, mushroomed, or loose. Always wear safety glasses with side shields.

WARNING: *Never use gasoline, naptha or any other volatile material for any cleaning purposes. These materials may be toxic and/or flammable.* M138

Take extra care around all flammable substances. Diesel fuel, gasoline, starting fluid, and battery gases are highly flammable and should be kept away from extreme heat and open flames, as well as out of areas where fumes may accumulate.

Do not permit any open flame or spark near the material handler when refueling or handling highly flammable materials.

Do not pile oily, greasy rags together. They are a fire hazard and should be kept in an OSHA approved container.

When using compressed air for cleaning parts, always wear safety glasses with side shields or goggles. Limit the pressure according to OSHA.

Do not use controls or hoses as a hand-hold when climbing into the cab of the handler. They are not stable and do not provide solid support. Controls may also move causing accidental or dangerous machine movement.

Never climb on, stand up, or climb off the handler while it is in motion. Do not jump on or off the handler. Always use the three point contact method. Keep two hands and one foot, or two feet and one hand in contact with the steps and grab rails at all times.

Keep the operator's platform, steps, grab-rails and handles clean of foreign objects, oil, grease, mud, or other accumulations to minimize the dangers of slipping or stumbling. Keep the operator's platform clear of all loose objects.

Never attempt to operate the machine from any other position than the operator's platform. Lift and handle all objects using proper lifting techniques, or with a lifting device if they are heavy.

WARNING: *Danger of falling components.*

Remember, the capacity of an eyebolt diminishes as the angle between the supporting members and the object becomes less than 90 degrees.

Eyebolts and brackets must never be bent and should only have stress in tension. M645

Use only designated towing or pulling attachment points. Use care when attaching towing devices. Be sure all pins and locks as provided are in place and secure. Stay clear of drawbars, cables, any other towing device when moving the material handler.

Do not adjust anything on the machine with the engine running unless directly specified by service/ maintenance procedures.

When making checks that require running the engine, have an operator at the operator's station with the mechanic in sight at all times if possible. Keep clear of moving parts. Stop the engine before making adjustments.

Before starting the machine be sure the area is clear. Sound the horn.

Never put head, body, limbs, feet, fingers, or hands near any moving parts.

Engine Safety

WARNING: *Injury can occur when removing the radiator cap.*

Steam or fluid escaping from the radiator can burn. Rust inhibitor contains alkali; avoid contact with skin and eyes.

Always shut down the engine and allow to cool down before removing the radiator cap. Remove the cap slowly to relieve pressure. Avoid contact with steam or escaping fluid. M646

Slowly turn the radiator cap to relieve built up pressure before removing. Add coolant only when the engine is stopped or idling.

Do not run the engine while refueling. Use care if the engine is hot due to increased possibility of fire from spilled fuel.

Never attempt to lubricate the unit while the engine is running.

WARNING: *Engine damage. Raw, unfiltered air can cause engine damage.*

Never service the air cleaner while the engine is running. M647

Avoid running the engine with unprotected air inlets. If such running is unavoidable for service reasons, place protective screening over the inlets before running the engine.

WARNING: *Some illustrations in this manual may show guards or cover panels removed for purposes of clarity.*

Always replace guards and cover panels before operation. M648

Ensure that all guards and shields are properly installed.

Disconnect the negative battery cable before doing any maintenance or repair on electrical circuits.

Disconnect the negative battery cable on internal combustion handlers.

Do not run the engine in a closed environment without proper exhaust ventilation.

Electrical Safety

Always turn engine OFF before servicing the machine.

Disconnect the negative battery cable before servicing the electrical system or when welding on the machine.

WARNING: *Batteries give off fumes that can explode.*

Be sure the battery area is well ventilated (clear of fumes) should it become necessary to connect a jump battery or charger. M649

Do not smoke or use an open flame near a battery.

Check for battery leaks before starting maintenance work. Eliminate all leaks before proceeding.

Do not change a battery in a closed area. Provide proper ventilation to guard against an accidental explosion. Leave the battery box open or remove the battery from the unit to increase ventilation.

Never use a metal object to check the battery charge by arcing across the posts.

Hydraulics Safety

WARNING: *Oil under pressure can cause serious cuts or injury.* M650

Exercise extreme care when working around pressurized hydraulic systems. Do not work on a hydraulic system while the engine is running or pressure is still in the system. Ensure all pressure is relieved from the system before performing maintenance.

Fluid escaping under pressure from a very small hole can be almost invisible and still have enough force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. Do not use your hands. If injured by escaping fluid see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

Stop the engine and be sure all pressure in the hydraulic system has been relieved before removing panels, housing covers, or caps. Move the control levers back and forth and slowly loosen and retighten hydraulic tank filler caps to relieve trapped pressure. Do this before loosening any hydraulic connections.

When making pressure checks, use the correct gauge for the expected pressure.

Service Cleanliness

It is extremely important to keep dirt and contaminants out of component parts. Ensure that any parts that are removed are thoroughly cleaned and then covered to keep out unwanted dirt. Keep all new parts in their original containers until you are ready to install them.

If fluid or electrical lines are disconnected, ensure that both mating surfaces are cleaned, covered, and correctly marked. As soon as the line is disconnected, cap, plug or tape both the line and opening. This will ensure proper reconnection and prevent system contamination.

Filters and covers have been provided on the machine to keep the machine systems clean and working at peak efficiency. Keep all panels, filters, and covers installed during operation. Damage to components can occur if exposed to dirt and contaminants.

Perform filter and lubricant replacement at scheduled intervals or earlier. Severe damage can occur if internal components are exposed to dirt and contaminants.

Removal and Installation

WARNING: *Improper maintenance can be hazardous.*

Read and understand SECTION 1001 - SAFETY AND GENERAL INFORMATION before performing any maintenance, service, or repairs. M622

Use a systematic procedure to locate and correct problems.

Find the best checks to verify the cause of the problem and conduct these checks in a logical order.

Do not skip around or perform the checks incompletely. Take the time to perform the checks properly.

Ensure that you tag all components that will not immediately be reinstalled.

If a part resists removal, check to ensure that all fasteners, lines, connectors, and adjacent parts are not interfering with the part being removed.

WARNING: *Danger of falling components.*

Remember, the capacity of an eyebolt diminishes as the angle between the supporting members and the object becomes less than 90 degrees.

Eyebolts and brackets must never be bent and should only have stress in tension.

M645

For heavy components , ensure that a suitable lifting device is used. Never support heavy components by using a lifting device alone. Ensure that a blocking device is installed that can support the full weight of the assembly being worked on. Never leave components suspended from the lifting device for any longer than it takes to install blocking. Do not leave heavy components in a position where they could shift position or fall.

When removing shims, wire the shim pack together and identify on a tag where the shims came from. Keep any shims flat and clean until they are ready for use.

Ensure that the holes in gaskets correspond with the lubricant passages in the mating parts. An improperly placed hole can cause serious damage.

Disassembly and Assembly

WARNING: *Improper maintenance can be hazardous.*

Read and understand SECTION 1001 - SAFETY AND GENERAL INFORMATION before you perform any maintenance, service, or repairs.

Read the specific service procedures for the components you will be working with before beginning repair. M651

Ensure that similar subassemblies are kept separate from each other if they are disassembled at the same time. Some parts are especially machined so that they can only be used as a set. These parts are commonly all marked with the same serial number and a letter code, and should be used or disposed of together.

Use all new locking devices when you reassemble a component.

Make sure that all parts are cleaned and thoroughly inspected before being reassembled. This prevents worn or damaged parts that are removed from being reinstalled.

Check to ensure that nothing has been overlooked.

Functionally check the component by operating the circuit or system.

Hydraulic System and Component Service

Never work on the hydraulic system while the engine is running or when there is still pressure in the system.

NOTE: *Dirt in the hydraulic system will lead to premature component failure. A clean, contaminant free system is extremely important to the machine's proper function. Take extra care when working around or on the hydraulic system to ensure its complete cleanliness.*

To keep contamination out of hydraulic system, clean around openings and ports before removing lines or components.

Flush the hydraulic system if you suspect contamination. Contamination of the system can lead to early component failure or possible major system failure.

Inspect all sealing components (O-rings, gaskets, etc.) when disassembling hydraulic components.

Replace all sealing components before reassembly or reinstallation.

Do not force hydraulic lines or tubing into fittings. This may cause cross-threading of the fittings, kinking or bending of lines and hoses, or improper connections that will leak.

Make sure that lines, hoses, and tubing are installed so that they do not rub or chaff on anything.

Inspect lines and hoses periodically for proper placement and for any unusual wear.

Electrical System

Disconnect the negative battery cable before doing any servicing of the electrical system.

Tag and secure electrical leads after removal to ensure proper reinstallation.

Inspect all wiring for frays, broken connections, damaged leads, and insulation that has worn through before reconnecting it.

Check that correct fuses are installed before testing an electrical system. This will protect the major components from severe damage.

Perform a quick visual check of all electronic gauges before full operation of the material handler. If an incorrect reading occurs, ensure that the gauge is reading correctly before troubleshooting a major component or system.

GENERAL INFORMATION

This Service Manual has the maintenance and repair instructions for the 689G Telescopic Handler. Functional descriptions are given in each section as an aid to understanding the repair of the major systems of the 689G. Lists for Troubleshooting are included at the end of each section.

The general specifications for the 689G are found at the end of this section. Specific information for a system is also found in the section for that system.

Scheduled maintenance procedures and lubrication requirements are found in the OPERATORS MANUAL.

A troubleshooting chart for each system is found at the end of each section for that system.

A Table of Contents for each section is at the beginning of that section.

The general safety rules are shown on the inside front cover of this service manual. The 689G must be operated according to the instructions in the OPERATORS MANUAL. Additional Warnings are given in the repair sections.

WARNING: *Indicates an action or condition that can cause injury to the operator or other persons.*

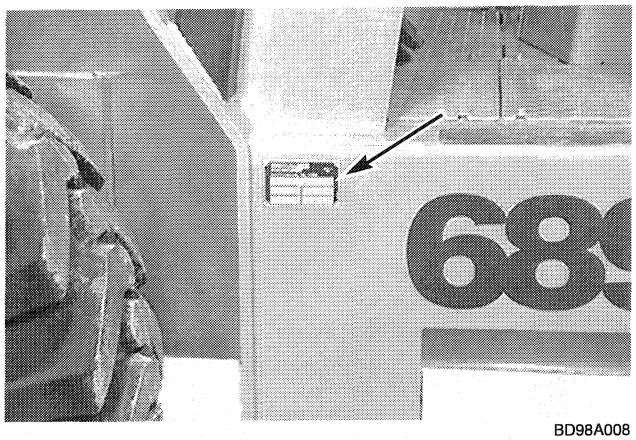
M711

WARNING: *Indicates an action or condition that can cause damage to this machine or other equipment.*

M712

Product Identification Number Plate (P.I.N.)

P.I.N. number data can be found on the Product Identification Number (P.I.N.) plate. The model number and P.I.N. number on the nameplate should be referenced when ordering parts for the machine and in any correspondence regarding the machine.



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Section

1002

GENERAL SPECIFICATIONS AND TORQUES

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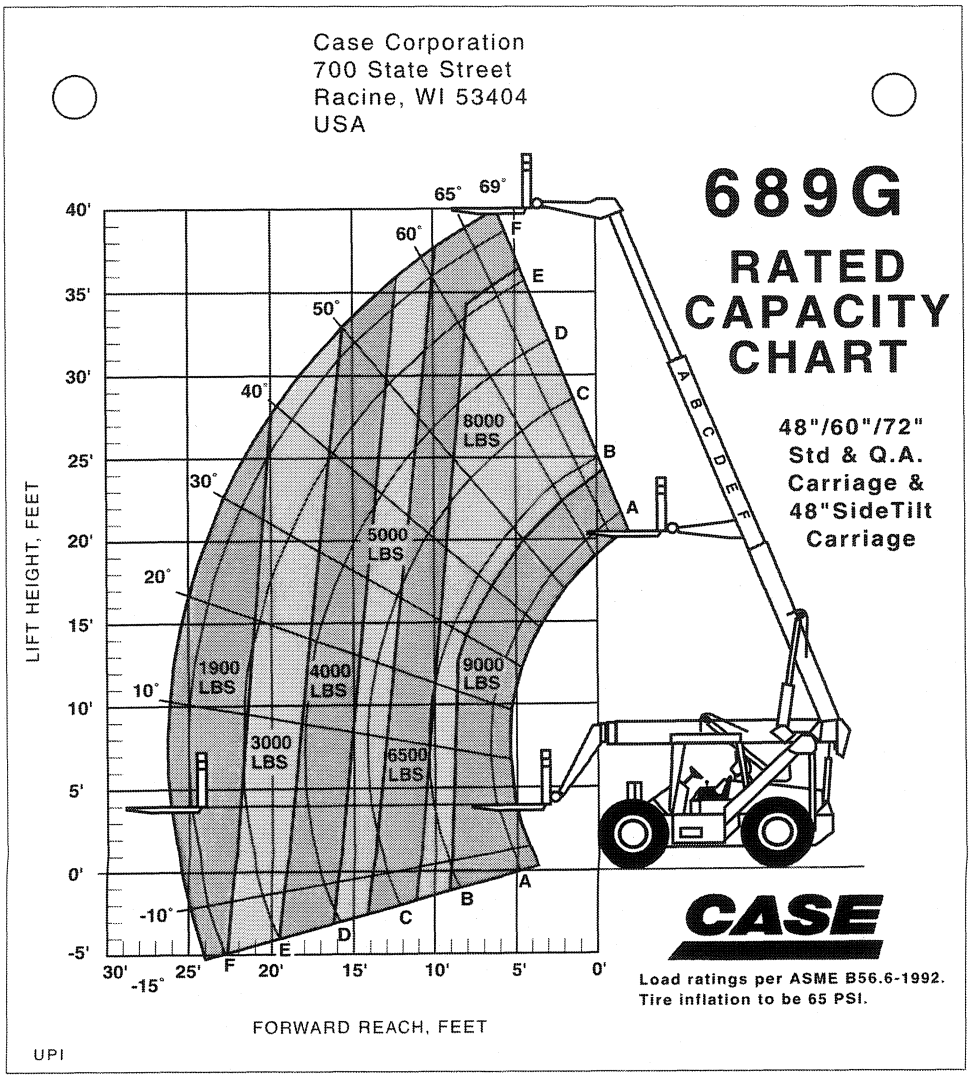
RATED CAPACITY CHART

WARNING: *Do not add to or modify the 689G. Any change to the 689G or its equipment can change the lifting capacity. The 689G must be rated as equipped and the Rated Capacity Chart must show the new capacity rating. See the rated capacity chart.* M595

The capacity of the 689G changes as the boom is raised or extended. The Rated Capacity Chart is found near the boom controls and shows the capacity of the 689G at different load positions. When loads are being moved, the operator must refer to the Rated Capacity Chart. The rated capacity of the 689G is also determined by the location of the center of gravity of the load. The Rated Capacity Chart defines the load capacity only when the 689G is on a level and stable surface.

An angle indicator on the left front of the outer boom shows the boom angle to the chassis of the 689G. The boom angle is shown on the Rated Capacity Chart by lines marked in degrees (deg) extending away from the 689G. Curved lines on the Rated Capacity Chart show the position of the load center of the load, at various angles, as the boom is extended. These lines are lettered A to F. These same letters are installed along the operator's side of the boom. When the boom is extended, the boom extension indicator (red arrow) will point at the letters on the boom.



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RATED CAPACITY CHART

The weight of the load must be known by the operator before the load is lifted to make sure that the load is within the capacity of the 689G as shown on the Rated Capacity Chart. When the load is lifted, the load is always raised with the boom retracted. Raise the boom to the required angle so that the boom can be extended to the point where the load will be stacked. See the boom angle on the boom angle indicator and find that angle on the Rated Capacity Chart. Find the letter on the Rated Capacity Chart that shows the extension of the boom permitted for the weight of the load being lifted. The point where the lines cross for the required boom extension and the boom angle is the maximum lifting capacity for those conditions.

Loads shown on the Rated Capacity Chart are based on the load center being 0.6 meter (2 feet) above and 0.6 meter (2 feet) forward of the horizontal forks.

WARNING: *Always raise the boom with the boom retracted. Raise the boom to the angle where the boom can be extended to the point where the load will be stacked or lifted. Then extend the boom to stack or lift the load. When the boom is raised, the load center can move away from the 689G.*

If the load is larger than the "standard" 48-inch cube or if the weight of the load is not evenly distributed, the weight of the load must be less than the capacity shown on the Rated Capacity Chart. M592

WARNING: *Raise the boom only when the 689G is on a stable surface. If the surface breaks or the tires sink into the surface, the 689G can tip over.* M593

WARNING: *Your 689G may be equipped with several different boom attachments. MAKE SURE that the Rated Capacity Chart you are using corresponds to the boom attachment fitted to the 689G at the moment.* M594

CAPACITIES AND SPECIFICATIONS

Engine Data

The specifications and tolerance details for engine repair are in a chart at the end of the engine section.

PERKINS Diesel 1004-4T

Power Rating at 2400 rpm ..... 80 kW (108 hp)

Number of cylinders 4

Firing order 1-3-4-2

Timing ..... 12° BTDC

Bore and stroke ..... 100 x 127 mm (3.937 x 5.000 inch)

Displacement ..... 4 litres (243 $inch^3$)

Compression Ratio 17.25:1

Minimum oil pressure ..... 280 kPa (40 psi)
(at maximum engine speed and normal operating temperature)

High idle speed ..... 2860 ± 2% rpm

Low Idle speed ..... 750 - 800 rpm

Stall speed ..... 1750 - 1850 rpm

Thermostat

- Begin to open ..... 77 - 85°C (170 - 185°F)
- Fully open ..... 92 - 98°C (198 - 208°F)

Valve clearance (cold)

- Inlet ..... 0.20 mm (0.008 inch)
- Exhaust ..... 0.45 mm (0.018 inch)

Engine oil capacity ..... 8.5 liters (9.0 qt)

Cooling System

- Capacity ..... 22.7 liters (24 qt)
- Pressure ..... 103 kPa (15 psi)

Fuel Tank

- Capacity ..... 136 liter (36 gallons)
- Type of Fuel ..... See Diesel Fuel Specification on page 11

ELECTRICAL SYSTEM

System voltage ..... 12 volts, Negative ground

Alternator (Motorola),

Case Part No. 309538A1 ..... 62 amperes at 2800 rpm (hot)

Regulator is part of alternator. ..... No adjustments

Starter (Magneti Marelli), Part No.
10 teeth on pinion
Sealed solenoid ..... Case Part No. 310467A1

Battery (quantity) ..... 1 (group 31) maintenance-free

Cold cranking amperes ..... 1000 amperes

POWERSHIFT TRANSMISSION

Engine speed at torque

Converter stall ..... 1750 - 1850 rpm

Torque converter: Type ..... Stator clutch

Transmission pump ..... 60.5 liters/min (64 qt/min)

Control valve ..... Remote mount under operator's compartment

Inch/brake control ..... Pedal

OIL

Type: Case ..... Hy-Tran Plus (MS 1207)

Capacity, transmission only ..... 16.1 liters (17.0 qt.)

Capacity, transmission and cooling ..... 20 liters (approx. 21 qt.)

AXLE SPECIFICATIONS

RATIOS

Gear Reduction, Total 19.31:1

Pinion and Ring Gear 5.29:1

Planetary Gears 3.65:1

OIL

Type: ..... SAE 90 EP

Differential carrier ..... 8 liters (17 pints)

Planetary hub (each) ..... 1.48 liters (2.5 pints)

WHEELS AND TIRES

Tire type, size, ply rating, and inflation pressure ..... Refer to decal on machine

Torque, Wheel Nuts ..... 306 Nm (225 lb ft)

STEERING SYSTEM

HYDRAULIC STEERING PUMP

Type ..... Gear

Displacement ..... 28.5 cm^3 (1.74 $inch^3$) per revolution

Capacity ..... 50 liters/min (13.3 gpm) @ 2000 rpm
3000 psi (@ 21 MPa)

FLOW CONTROL VALVE - Controlled (Priority) flow to steering system

Control Spring Pressure ..... 690 kPa (100 psi)

Relief Valve Setting ..... 10.5 MPa (1500 psi)

STEERING CONTROL UNIT

Type ..... Hydrostatic, Open-center, Non-load-reaction

Lubrication ..... Hydraulic oil

Displacement ..... 292 cm^3 (17.8 $inch^3$) per revolution

Turns, Stop-to-Stop ..... 3.5 approximately

STEERING CYLINDERS (4)

Type ..... Double-acting

WHEEL ANGLES (Full Turn)

Inside Wheel ..... 31 Degrees

Outside Wheel ..... 24 Degrees

Toe-in, each wheel ..... 0°15 feet maximum to 0° 0 feet minimum

BRAKE SYSTEM

ACCUMULATOR

Pre-charge Pressure (Nitrogen)	475 psi (3.33 MPa)
Volume	2788 cu cm (170 cu in)

BRAKE VALVE

Piston Stroke	9.1 mm (0.36 inch)
Accumulator Charging Limits Low Limit	550 - 650 psi (3.85 - 4.55 MPa)
High Limit	1275 - 1325 psi (8.93 - 9.27 MPa)
Accumulator Charging Rate	7.57 - 12.1 liter/min @ 7 MPa (8 - 12.5 qt/min @ 1000 psi)
Brake Pressure, Maximum	400 - 450 psi (2.8 to 3.15 MPa)
Filter, Internal	100 micron (0.0039 inch)

SERVICE BRAKES

Friction Disc Replacement Index	Groove depth less than 0.13 mm (0.005 inch)

PARKING BRAKE-DISC

Disc Diameter	330 mm (13.0 inch)

HYDRAULIC SYSTEM

HYDRAULIC SYSTEM

Hydraulic System, initial fill (approximately)	104.4 liter (110 qt.)
Hydraulic Tank	54.9 liter (58 qt)
Normal operating Temperature	55 - 65° C (130 - 150°F)
Piston Pump	
Type	Variable Displacement Piston
Capacity @ 2520 rpm	78.39 litres/min (20.5 gal/min)
Displacement	51.13 cm^3 (3.12 $inch^3$) per revolution
Relief Valves, Control Valve	
Boom & Extend	17.6 - 18.3 MPa (2550 - 2650 psi)
Tilt & Frame Leveling	17.9 - 18.6 MPa (2600 - 2700 psi)
Auxiliary (optional control valve)	14.8 - 15.5 MPa (2150 - 2250 psi)
Relief Valves, Motion Control (boom and tilt)	21.9 - 22.2 MPa (3175 - 3225 psi)
Relief Valves, Dual Motion Control (boom extend)	20.5 - 20.9 MPa (2975 - 3025 psi)

BOOM AND EXTENSION SYSTEM

Maximum lift height	40.2 ft (12.2 m) top of forks
Maximum below grade	5 ft 3 in (1.6 m)
Maximum reach	25 ft 3 in (7.69 m) (face of carriage)
Range of boom (angle)	-15° to +69°
Total extension length	19 ft (5.8 m)
Boom speed, no load, stop to stop, 2650 rpm engine speed:	
Raise	11.77 seconds
Lower	10.65 seconds
Extend	13.62 seconds
Retract	10.76 seconds

TILT SYSTEM

Tilt angle with boom level

Forward	83.5°
Backward	27.5°
Total tilt range	111°

Tilt speed at governed engine speed

Foward	17.1 seconds
Backward	12.8 seconds

FRAME LEVELING

Angle articulation, side to side	12°

TORQUE VALUES

Piston capscrew, extend cylinder	1225 - 1500 Nm (900 - 1100 lb-ft)
Piston nut, boom lift cylinder	680 - 748 Nm (500 - 550 lb-ft)
Piston nut, carriage tilt cylinder	1225 - 1292 Nm (900 - 950 lb-ft)
Piston nut, frame leveling cylinder	490 - 600 Nm (360 - 440 lb-ft)
Capscrew, mount bracket to end of extend cylinder	149 Nm (110 lb-ft)
Capscrews, wear shoes	109 Nm (80 lb-ft)
Maximum clearance between boom Sections and wear shoes	1.5 mm (0.060 inch)

DIESEL FUEL

Use No. 2 diesel fuel in the engine of this machine. The use of other fuels can cause the loss of engine power and high fuel consumption.

In very cold temperatures, a mixture of No. 1 and No. 2 diesel fuels is temporarily permitted. See the following Note.

NOTE: *See your fuel dealer for winter fuel requirements in your area. If the temperature of the fuel is below the cloud point (wax appearance point), wax crystals in the fuel will cause the engine to lose power or not start.*

The diesel fuel used in this machine must meet the specifications in the chart below or Specification D975-81 of the American Society for Testing and Materials.

Fuel Storage

If you keep fuel in storage for a period of time, you can get foreign material or water in the fuel storage tank. Many engine problems are caused by water in the fuel.

Keep the fuel storage tank outside and keep the fuel as cool as possible. Remove water from the storage container at regular periods of time.

Specifications for Acceptable No. 2 Diesel Fuel

API gravity, minimum	34
Flash point, minimum	60°C (140°F)
Cloud point (wax appearance point), maximum	-20°C (-5°F) See Note above
Pour point, maximum	-26°C (-15°F) See Note above
Viscosity, at 88°C (100°F)	
Centistokes	2.0 to 4.3
Saybolt Seconds Universal	32 to 40